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Nutrient Values of *Chrysophyllum Albidum* Linn African Star Apple as a Domestic Income Plantation Species

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Abstract
This study analyzed the nutritive composition of Chrysophyllum albidum Linn. It was necessitated by the need towards creating awareness that this species can provide nutrient supplements for the larger percentage of the population in the rural and peri-urban communities. Chrysophyllum albidum locally called "Udara" is one of the 80 species of Chrysophyllum Linn, a pan-tropical genus. Market Survey was done to collect data from three major markets in Rivers State known for assorted fruits business. Eight to ten of morphologically differing types were characterized and further identified into types. Nine fruit types were morphologically identified and comprehensively analyzed in Food Science and Technology Laboratory, Rivers State University of Science and Technology for nutrient content. The analysis has shown that Chrysophyllum albidum has an approximation of carbohydrate (11%), crude fibre (4%), Lipids (3%), protein (7%), Calcium (17.11ppm), Iron (< Ippm), phosphorus (9.92ppm), vitamin C (25.03ppb), A (10.74ppb), B1 and B2 (< 1ppb). It is recommended that the awareness of the nutritive value of this species be created so as to increase it's consumption as food supplement to the larger population and expand its utilization.

Keywords: *Chrysophyllum albidum* C, Food fruits, nutrients, Fruit plantations, Income plantations.

Introduction

One of the indigenous wild fruit trees with enormous potential for plantation establishment is the African Star apple. Star apple which is known as "Udara' and botanically called *Chrysophyllum albidum* (Linn) belongs to the family sapotaceae and its natural occurrence has been reported in Nigeria, Uganda, Niger Republic, Cameroon and cote d' ivore (Adewusi and Bada, 1997). It is a tree with great potentials not only as a plantation species, but as an important tree in compound agro- forestry system (Okafor, 1981, Okigbo, 1978). ICRAF (2007) noted that the fleshy and juicy fruits, which are popularly eaten, are the potential source of a soft drink. The fruits are also suitable for the production of fruit jams and jellies. Ecologically, the tree has an efficient nutrient cycling and the high rate of mineralization of the leaves improves the quality of the top soil (Adesina, 2005). Achinewhu (1983) reported that fruit pulp of Chrysophyllum *albidum* contains 21.8mg/100gm ascorbic acid, and the skin contains 75mg/100gm while Edem *et al*., (1984) reported 446mg and 239mg/100g for pulp and skin respectively. These different reports suggested that there may be different varieties of the species. The juice of the fruit has potentials as an ingredient of soft drinks and can be fermented for wine or other alcohol production (Ajewole and Adeyeye, 1991). Ajewole and Adeyeye (1991) also confirmed that unsaturated fatty acids are the main components of the oil (74%) and is desirable in the context of heart disease risk reduction. The residual cake also has potential for animal feed.

The objective of the study was to determine the nutrient value of *Chrysophyllum albidum* by physico – chemical laboratory analysis of each identified type. The information on the nutritional value may help to increase the consumption and utilization of this species for various purposes.

Material and Methods

Eight to ten fruits of differing morphological features were characterized and identified as fruit types respectively. The fruit characterization was based on, ripe fruit colour, ripe fruit length, fruit diameter, fruit shape, pulp colour, taste, number of seeds per fruit, seed width and seed length. The pulp of each identified type was analyzed for nutrient content in the Food Science and Technology Laboratory, Rivers State University of Science And Technology, Port Harcourt, Nigeria.

A proximate analysis of the nutrient compositions of the varieties was carried out. A total of 73 fruits were used for the nutrient analysis. The following were determined with different laboratory methods as follows:

a. **Moisture Content**: This was determined by oven drying method and the Moisture content in the sample was determined by the measurement of the loss in weight due to drying at a temperature just above 100^{o}C.

b. **Ash**: This was determined by the dry-ashing method using muffle furnace. It implies ignition of the organic compounds at 550^{o}C – 600^{o}C by heating with a flame in an open dish or crucible before putting in the furnace. The residue remaining after the destruction of the organic matter sample used was weighed as total ash.

c. **Crude Fibre**: This is the insoluble and combustible organic residue that remains after the sample has been treated under prescribed conditions. The method employed for the sample is the procedure laid down in the fertilizers and feeding stuffs (Amendment) Regulations 1976 SI NO 840 (cited by Egan et al., 1981).

d. **Carbohydrate**: This was determined using the Anthrone method. The sample was digested with perchloric acid. Hydrolyzed starches together with soluble sugars were determined colourimetrically by the Anthrone method and expressed as glucose.

e. **Protein**: Crude protein was determined by the Micro Kjeldhal method.

f. **Potassium**: This was determined in milligram per 100g of the sample using flame photometer method.

g. **Calcium (mg/100gs):** This was determined in a solution of ashed sample by Precipitating the oxalate and titration with the di-sodium salt of ethylene diaminetetra acetic acid (EDTA). (Cited by Egan et al., 1981).

h. **Iron (Mg/100gs):** The traces of Iron in the sample were determined by Potassium thiocyanate method.

i. **Nicotinic acid:** This was determined by the method proposed by Dennis and Rees (1949). This method was based on the yellow colour developed when pyridine is treated with cyanogens bromide in the presence of an aromatic amine (Cited by Egan *et al.*, 1981).

j. **Vitamin C**: This was determined by using a 0.1% solution of 2,6 Dichloropheno lindophenol dye in the Pekar board test (Cited by Egan *et al*., 1981).

k. **Vitamin A:** It was determined by the rapid carr-price method, in which the blue colour formed with antimony trichloride was measured using the ultra-violet absorbance in an organic solvent (Cited by Egan *et al*, 1981).

l. **Thiamin**: This was determined by Jansen's thiochrome method. The fluorescent was measured directly in a spectrofluorimeter (Cited by Egan et al, 1981).

m. **Riboflavin**: This was determined by a fluorimetric method.

n. **Caffeine**: This was determined by the automated techniques (cited by Allen *et al.*, 1974.

All data were statistically analyzed.

Results and Discussion

The proximate laboratory analysis results are presented in table 1 below.

The result showed that different levels of nutrient are contained in each fruit type identified. It is note- worthy that contrary to the high market value of the very sweet fruit type due to sweet taste, the less sweet one (type 5) seems to have the highest energy value (99.92Kcal) and vitamins. It has less moisture content (70%) than others, highest percentage of Ash (3.0%), Carbohydrate (10.96%), Lipid (3.0%), Energy value (99.92Kcal), and phosphorus (13.2%), Vitamin C (26.84%), Vitamin A (12.5%), Thiamin (0.06%) and Riboflavin (0.052%). The type 1 identified as the sweetest by taste contains less

percentage amount of some of the nutrients. It contains almost the highest percentage of moisture 75%, lowest percentage of Ash (2.5%), Lipid (2.2%), Protein (5.89%), Energy value (86.40Kcal), Calcium (14.30%), Phosphorus (8.58%). It has the highest percentage of Nicotinic acid, (0.92%), which according to the nutrient classification is toxic material. The percentages of vitamins are not really higher than the less sweet. But according to taste appeal, it is the sweetest and most preferred by people. This result agreed with Umelo (1997) who stated that *C. albidum* is an excellent source of vitamins, iron, and flavours to diet.

Conclusion

The nutrient content proximate analysis indicated that type 1 which is the very sweet fruit has some nicotinic aid which is a toxic material according to nutrient classification and the vitamins are not really nutritionally higher than others which are less sweet and sour. It also has the highest moisture content despite its smaller size. The sour types according to the result of the analysis might offer better health services than the sweet types. Thus type 5, which is one of the sour ones, was found to have the highest nutritive content in most considerations than others. Conclusively whether sweet, very sweet or sour, the fruits will contribute a lot towards providing nutrient supplements for children and women in rural communities and should support better utilization of the species in domestic industries.

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Table 1: ***Chysophyllum albidum* – Fruit Nutrient Composition**

	Proximate composition							Minerals			Tonic materials		Vitamins (µ/100g)			
Sample	**% Moisture**	**% Ash**	**% Fibre**	**% Cho**	**% Liquid**	**% Protein**	**Energy Value (Kcal)**	**Ca Mg/100g**	**Fe^{2+} Mg/100g**	**P + Mg/100g**	**Caffeine cafin**	**Nicotinic Acid**	**Vitamin C Mg/100g)**	**Vitamin A**	**Thiamin Vit B_1**	**Riboflavin Vit B_2**
Type1(Nwannu)	75	2.50	3.50	10.76	2.20	5.89	86.40	14.30	0.40	8.58	Nil	0.92	24.50	10.20	0.03	0.04
Type 2 (Udara)	75	2.55	4.20	10.38	2.40	6.43	88.84	14.25	0.42	8.50	Nil	0.74	25.50	10.60	1.03	0.04
Type 3 (Udara)	70	2.50	3.50	10.76	2.60	6.45	92.24	15.75	0.46	9.40	Nil	0.74	24.40	10.10	0.04	0.04
Type 4 (Udara)	75	2.60	3.55	10.38	2.40	6.38	88.64	14.80	0.52	10.30	Nil	0.69	23.75	11.20	0.03	0.04
Type 5 (Udara)	70	3.00	3.00	10.96	3.00	7.27	99.92	19.00	0.46	13.2	Nil	0.63	26.34	12.50	0.06	0.05
Type 6 (Udara)	77.5	2.70	4.20	10.76	2.30	7.27	92.82	18.40	0.75	9.72	0.0001	0.47	25.80	10.60	0.04	0.04
Type 7 (Udara)	72.5	2.60	3.50	10.00	2.50	7.45	92.30	19.45	0.50	9.83	Nil	0.58	24.70	10.20	0.04	0.03
Type 8 (Udara)	72.5	2.70	3.55	10.38	2.40	6.43	88.84	18.50	0.50	9.98	0.0020	0.63	25.25	11.20	0.04	0.03
Type 9 (Udara)	72.5	2.65	3.50	10.00	2.60	6.60	89.80	19.50	0.48	9.75	0.0001	0.74	25.10	10.10	0.03	0.03
Total																
Mean	73.33	2.64	3.61	10.49	2.49	16.99	91.09	17.11	0.50	9.92	0.0007 3	0.68	25.03	10.74	0.15	0.04
Standard Error	±0.83	0.05	0.12	0.12	0.08	10.38	1.31	0.76	0.03	0.46	0.0006 3	0.04	0.26	0.26	0.11	0.002